DEEPENING/SHALLOWING CYCLES IN CARBONATE EPICONTINENTAL PLATFORMS

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Taphonomic and palaeobiological data enable the interpretation of relative changes of sea level, cyclical and of different order of magnitude, occurred in carbonate epicontinental platforms. These palaeontological data are of stratigraphic interest since they provide an independent test of the cycles distinguished in sequence stratigraphy.

Problems of three categories arise attempting to recognize third-order depositional sequences, depositional systems or systems tracts in carbonate epicontinental platforms: 1) Lowstand systems tracts are not usually represented in shallow environments of epicontinental platforms. In these depositional settings, each third-order depositional sequence corresponds mainly to highstand deposits. In carbonate epicontinental platforms, the maximum rate of carbonate production takes place during the development of the highstand progradational depositional systems. 2) Each third-order depositional sequence comprises a transgressive depositional system of very limited thickness, developed in deepest or most protected areas of epicontinental platforms. Deposits forming the transgressive or retrogradational depositional systems typically compose thinning- and fining-upwards sedimentary sequences containing condensed recorded associations. These sequences are also classically known to be formed by condensed sediments. Yet, the degree of sedimentary condensation may be very different according to the relative depth of the platform: condensed sediments are deposited in distal and deep areas while expanded sediments develop laterally, in proximal and shallow areas. However, condensed associations are also represented in highstand systems tracts of shallow areas. 3) In the shallow environments of the platform, where subsidence rates were low, late highstand (regressive) facies are largely missing. Consequently, in shallow epicontinental platforms, the successive depositional sequences are represented by successive highstand systems tracts, showing the same geometry and composed by similar parasequences or sets of parasequences.

Third-order transgressive/regressive sedimentary cycles and deepening/shallowing cycles comprise one or more depositional sequences of third order. Transgressive/regressive sedimentary cycles of third order comprise cyclical variations of relative sea-level. Yet, environmental deepening/shallowing cycles of third-order, also involving cyclical variations of the potential of accommodation of sediments, can exclusively result from cyclical variations of the subsidence. The transgressive/regressive cycles can be inferred on the basis of the time-space relationships between the different environments which compose the deepening/shallowing environmental cycles. In carbonate epicontinental platforms, relative changes of sea level resulting from eustatic movements and subsidence also led to particular taphonomic cycles: the so-called deepening/shallowing taphocycles. Recorded associations of ammonites formed in carbonate epicontinental platforms can be grouped on the basis of taphonomic criteria in taphorecords of different categories: incipient-, mean- or advanced-deepening, as well as incipient-, mean- or advanced-shallowing. The identification of deepening/shallowing cycles is of utmost importance in interpreting the transgressive/regressive cycles in carbonate epicontinental platforms,where no evidence of coastal onlap is preserved but fossiliferous sediments of outer platform are widely developed, as it occurs often in the European platforms during the Jurassic.